

Appendix C, Exhibit 3

Emissions Modeling Assumptions

Used to Develop Motor Vehicle Emission Budgets for the Atlanta Eight-Hour Ozone 15% Reasonable Further Progress Plan and Attainment Demonstration

On April 30, 2004, the United States Environmental Protection Agency designated 20 counties within the metropolitan Atlanta area as a "marginal" nonattainment under the eight-hour ozone standard. The eight-hour ozone nonattainment area encompasses the previous 13-county one-hour ozone nonattainment area plus seven additional "ring" counties: Barrow, Bartow, Carroll, Hall, Newton, Spalding, and Walton. With an attainment deadline of June 15, 2007, marginal 8-hour ozone areas were required to attain the National Ambient Air Quality Standard (NAAQS) by the 2006 ozone season. Because monitoring data from the 2006 ozone season indicated that Atlanta had not attained the NAAQS, the area was reclassified to "moderate"). Regional emissions inventories for the 20-county eight-hour ozone nonattainment area are needed to develop Motor Vehicle Emission Budgets (MVEB) for NO_x and VOC as part of the State Implementation Plan (SIP) revisions that will demonstrate reasonable further progress towards attainment and modeled attainment of the eight-hour ozone standard in Atlanta.

In ozone nonattainment areas with air quality classified as "moderate" or worse, the reasonable further progress (RFP) requirement established in Section 182(b) of the CAA prescribes emission reductions from the baseline totaling 15% within six years of the base year (i.e., by the end of 2008 for the 8-hour ozone NAAQS). MVEB are being established for the year 2008, the RFP milestone year. Separate MVEB are being established for 2009, the last full ozone season before the June 15, 2010, "maximum attainment date" for a moderate ozone area. Below is a detailed listing of the procedures and planning assumptions that were used for the regional emissions inventories to support MVEB development. This document was submitted to the Interagency Consultation Group, in accordance with Section 93.105(b) of the Transportation Conformity Rule and Sections 106(g) and 106(h) of Georgia's transportation conformity SIP, all of which require interagency consultation for SIP development, on October 28, 2008.

Section 1: General Methods and Assumptions

- Regional emissions inventories completed to establish MVEB for Atlanta Eight-Hour Ozone 15% RFP Plan and Attainment Demonstration
- Emissions Modeling Methodology
 - Eight-Hour Ozone Nonattainment Area:
 - Existing ARC link-level travel demand and emissions modeling process for 20-county Atlanta ozone nonattainment area

Section 2: Travel Demand Modeling Assumptions

- Calibration Year: 2000
- Project Listing:
 - As approved in Envision6 2030 RTP and 2008-2013 TIP; adopted by the ARC Board September 26, 2007; and received a positive conformity determination from USDOT October 10, 2007
 - As approved in 2030 LRTP and 2008-2013 TIP; adopted by GHMPO Board August 14, 2007; and received a positive conformity determination from USDOT October 10, 2007
 - Project coding for network years 2005 and 2010 reviewed by state and local project sponsors in March and April 2007 as part of Envision6 2030 RTP/FY 2008-2013 TIP development
 - Year 2008 and 2009 networks needed for budget inventories derived from 2010 travel model network
- Travel demand model refinements implemented as part of model expansion to 20 counties, from the previous 13-county platform:
 - Mode choice model updated to improve performance of suburban intra-county trips
 - Attraction share model incorporated into four-step modeling process
 - New commercial vehicle and truck model developed to improve traffic assignment for both passenger vehicles and truck traffic
- Demographic Data: See "Demographic Data Used to Develop Motor Vehicle Emissions Budgets for the Atlanta Attainment Demonstrations"
- Speed Data: Free-flow Speed by Area Type and Facility Type

Note: Within the ARC travel demand and emission modeling process, free flow speeds are adjusted to reflect the increase in delay and travel time on a roadway segment as traffic volumes build and congestion levels increase. Link-level congested flow speeds are used to estimate mobile source emissions, consistent with the requirements of Sections 93.122(b)(1)(iv) and 93.122(b)(2) of the Transportation Conformity Rule.

Free Flow Speed by Area Type and Facility Type

	Facility Type	Area Type							Metered Ramps
		Urban Very High Density	Urban High Density	Urban Medium Density	Urban Low Density	Suburban	Exurban	Rural	
0	Zone Centroid Connectors	7	11	11	11	11	14	14	
1	Interstate / Freeway Free Flow	55	58	58	61	61	63	65	
2	Parkway	50	50	55	55	57	60	60	
3	HOV Buffer Separated	55	58	58	61	61	63	65	
4	HOV Barrier Separated	55	58	58	61	61	63	65	
5	High Speed Ramp / CD Road	50	50	55	55	57	60	60	15
6	Medium Speed Ramp	50	50	50	50	50	50	50	10
7	Low Speed Ramp	40	40	40	40	40	40	40	10
8	Loop Ramp	30	30	30	30	30	30	30	10
9	Off Ramp w/ Intersection	25	25	25	25	25	25	25	
10	On Ramp w/ Intersection	40	40	40	40	40	40	40	5
11	Expressway	40	42	45	48	52	55	60	
12	Principal Arterial - Class I	26	30	33	36	42	46	55	
13	Principal Arterial - Class II	24	27	30	34	40	44	48	
14	Minor Arterial - Class I	22	25	28	31	38	42	45	
15	Minor Arterial - Class II	20	23	26	29	34	38	42	
16	HOV - Arterial (all classes)	20	27	30	33	36	39	42	
17	Major Collector	18	22	25	28	31	34	38	
18	Minor Collector	15	18	21	24	27	30	35	
19	Planned Ramps w/ Intersections	30	30	30	30	30	30	30	5
20	Planned Directional Ramps	45	45	45	45	45	45	45	10

- Transit Modeling
 - Model recalibrated to 2000 transit ridership estimates, provided by transit operators
 - Reflects results from Transit On Board Survey
 - Routes updated to reflect current operating plans
 - Transit mode split is estimated using the mode choice model
 - Estimates individual modal trips from the person trip movements developed in the trip distribution model.
 - Composed of three nested logit models:
 - Home based work trips, which includes home based university trips;
 - Home based other trips, which include home based other, home based shopping and home based grade school; and
 - Non-home based trips.
 - The mode choice models is organized in terms of seven characteristics:
 - Mathematical structure;
 - Trip purposes and choice sets;
 - Limitations on choice sets;
 - Analysis of transit access;
 - Treatment of HOV lanes;

- Stratification by income groups; and
- Analysis of alternative transit paths.
- Transit Fare Modeling
 - Fare structure and operating plans supplied by the local transit operators
 - Fares remain constant over time, across all network years
 - Fares reflect current transit operating plans
 - Transit fare structure uses a fare matrix on a zone to zone level with a universal fare structure (flat fare) for all bus and rail lines
 - Changes to the existing fare structure and service frequency are coded directly into the model
 - Current fare values in the model are weighted according to the percentage of riders using a discounted fare pass; changes to these assumptions can be incorporated directly into the model
 - Peak and off-peak fares are equivalent

Section 3: Emissions Modeling Assumptions

- Emission Factor Model: MOBILE6.2.03
- MOBILE6.2.03 Inputs (13-county portion)
 - Average hourly temperature, humidity, and average barometric pressure for the 10 highest ozone days during 2000-2002
 - Stage II refueling
 - Started in 1992
 - Three phase in years
 - 81% efficiency
 - Anti-tampering program
 - Started in 1982
 - Covers model years 1975 – 1995
 - All LDG vehicle types are covered
 - Annual program
 - 97% compliance
 - Catalyst removal only
 - I/M Program
 - Exhaust and Evaporative (OBD and gas cap pressure test) for 1996 and newer vehicles
 - Began in 1982
 - Annual inspection required
 - Computerized test and repair OBD – Exhaust
 - Computerized test and repair OBD & GC - Evaporative
 - Applies to all LDG vehicle types
 - Three year grace period
 - 3% waiver rate for all vehicles – Exhaust test
 - 0% waiver rate for all vehicles – Evaporative test
 - 97% compliance

- Exhaust and Evaporative test for 1975 – 1995 vehicles
 - Began in 1982
 - Annual inspection required
 - Computerized test and repair ASM 2525/5015 Phase-in – Exhaust
 - Computerized test and repair GC – Evaporative
 - Applies to all LDG vehicle types
 - 3% waiver rate for all vehicles – Exhaust
 - 0% waiver rate for all vehicles – Evaporative
 - 97% compliance
 - 25 year and older model years are exempt
 - Fuel¹
 - Low Sulfur, Low RVP Georgia Gasoline Phase 2
 - 100% market share of 10% ethanol-blend gasoline (E10) assumed
 - volatility waiver for E10 allows 8.0 psi RVP
 - 2002 regional fleet age distribution
 - Derived from R.L. Polk & Co. registration data for 13-county area
 - Applied to 15 of the 16 MOBILE6.2.03 composite vehicle classifications - LDV, LDT1, LDT2, LDT3, LDT4, HDV2B, HDV3, HDV4, HDV5, HDV6, HDV7, HDV8A, HDBS, HDBT, MC
 - Default for HDV8B
 - Default VMT fractions
 - MOBILE6.2.03 Inputs (7-county portion)
 - Same temperature, humidity, and barometric pressure inputs as 13-county area
 - No Stage II refueling
 - No anti-tampering program
 - No I/M program
 - Fuel
 - Same as 13-county area
 - 2002 regional fleet age distribution
 - Derived from R.L. Polk & Co. registration data for 7-county area
 - Applied to 15 of the 16 MOBILE6.2.03 composite vehicle classifications - LDV, LDT1, LDT2, LDT3, LDT4, HDV2B, HDV3, HDV4, HDV5, HDV6, HDV7, HDV8A, HDBS, HDBT, MC
 - Default for HDV8B
 - Default VMT fractions
 - VMT adjustment factors
 - Adjusts link-level VMT produced by travel model for ozone precursor emissions modeling:

¹ In 1999, Georgia's two-phase gasoline sulfur control program limited average sulfur in gasoline sold in the 13-county Atlanta area and in 12 surrounding counties to 150 parts per million (ppm). In addition, there is a seasonal (June 1 to September 15) 7.0 pounds per square inch (psi) Reid vapor pressure (RVP) cap on gasoline sold in this Phase 1 area. In 2003, Phase 2 of Georgia's gasoline rule reduced average sulfur to 30 ppm and added 20 additional counties outside the 20-county ozone nonattainment area to the sulfur and RVP control program.

- HPMS adjustment in base year of calibration, year 2000, in accordance with Section 93.122(b)(3) of the Transportation Conformity Rule which recommends that HPMS adjustment factors be developed to reconcile travel model estimates of VMT in base year of calibration to HPMS estimates for the same period²
- Summer (seasonal) adjustment to convert from average annual VMT to summer-season VMT³
- Factors applied to VMT estimates generated by ARC travel demand model for 13-county and 7-county portions of 20-county nonattainment area, separately

VMT Adjustment Factors – 13 County Portion

Functional Class Name	Factor
Rural Interstate	0.67
Rural Prin. Arterial	1.02
Rural Min. Arterial	1.16
Rural Major Collector	0.88
Rural Minor Collector	1.07
Rural Local	0.64
Urb. Interstate	1.05
Urb. Other Fwy	2.44
Urb. Prin. Arterial	0.67
Urb. Min. Arterial	1.21
Urbanized Collector	1.21
Urbanized Local	0.95

VMT Adjustment Factors – 7 County Portion

Functional Class Name	Factor
Rural Interstate	0.89
Rural Prin. Arterial	0.99
Rural Min. Arterial	0.98
Rural Major Collector	1.81
Rural Minor Collector	1.81
Rural Local	1.10
Urb. Interstate	0.86
Urb. Other Fwy	0.85
Urb. Prin. Arterial	0.97
Urb. Min. Arterial	0.96
Urbanized Collector	1.80
Urbanized Local	1.06

- Off-Model Calculations
 - The Senior I/M Exemption emissions debit calculated for 2002 was considered conservatively high and was also added to the 2008 and 2009 budget year inventories

² 40 CFR Part 93.122(b)(3)

³ *Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources*, Section 3.4.2.6, EPA420-R-92-009, USEPA Office of Air and Radiation, Office of Mobile Sources, 1992.